AN IMPROVED METHOD FOR DIAGNOSING PEMPHIGUS

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Almost 25 years ago one of the authors began to develop a new department of biology to which the name of phytopharmacology was given. This term is meant to designate the employment of living plants or plant tissues for the detection of drugs and poisons (1, 2). One of the most fruitful results yielded by such studies was the discovery of various toxins present in the blood which could not be demonstrated by zoopharmacological experiments or the employment of living animal tissues as test objects. As a result it was demonstrated that there is a toxin—menotoxin—present in the blood and other secretions of menstruating women (3). Another discovery was the presence of a specific toxic substance in the blood of pernicious anemia which is not present in blood samples obtained from all other forms of anemia and of leukemia (4, 5, 6, 7). Still other toxins thus discovered were those of leprosy (8), and trachoma (9, 10). A good resume of the author's phytopharmacological studies is published elsewhere (11).

Perhaps the largest number of cases examined by phytopharmacological methods was yielded by examination of blood specimens from various skin diseases. As early as 1927 Macht and Pels announced for the first time the discovery of a specific toxin found in the blood sera of pemphigus patients (12). This toxic reaction demonstrated by Macht was not given by any other dermatoses procured for him by the dermatologist I. R. Pels with the exception of leprosy. A number of longer papers on the subject followed at intervals of a few years (13, 14, 15), and Macht (16) and Grumbein (17) could actually detect the toxin of pemphigus in dried and frozen blood specimens. At the present time the diagnosis of pemphigus by the socalled Macht-Pels phytotoxic test has been applied to nearly 3,000 cases and samples of blood for such examinations are being received constantly in Dr. Macht's laboratory. It may be stated conservatively that the diagnosis of pemphigus made by the phytopharmacological methods of Macht has been confirmed or corroborated by other diagnostic measures and the course of the disease in 90 to 95% of the patients examined (table 1).

In the past two years the present writers have been collaborating in the departments of pharmacology and radiology of the Sinai Hospital, Baltimore, on the subject of what may be designated as "Radiological Pharmacology" or the study of the pharmacological effects produced by various X-rays. Some years ago the senior author tested the effect of ultraviolet rays from a mercury vapor lamp on the blood of pemphigus patients without obtaining any appreciable effect on the toxicity as measured by the phytopharmacological test (18). It was now deemed worthwhile to investigate the effect of X-rays on pemphigus blood serum *in vitro*. The results obtained were very surprising. The present writers found that exposure (in open glass vials) of serum samples from cases of pemphigus to short X-rays for 5 or 6 minutes produced complete detoxification of the pemphigus blood. The best results in this connection were obtained

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with rays from a water-cooled X-ray therapy lamp operated on 200 K.V. at 20 M.A., the rays being passed through a composite filter of 2 mm. of copper at a distance of 50 cm. from the vial containing the serum.

What was equally surprising was the fact that other sera examined by the authors, with the exception of one kind to be described in another paper, were not detoxified by the X-rays. As a matter of fact, the usual effect of short X-rays on normal serum is to render it slightly more toxic for phytopharmacological test objects. This fact confirmed an earlier observation made on normal blood sera with Coolidge tubes and X-rays by Macht and Eben Hill some years ago (19). Table 2 exhibits the phytotoxic indices obtained with normal blood serum and sera of pemphigus, and a number of other diseases. Table 3 shows the phytotoxic indices obtained by the Macht-Pels test on the

TABLE 1

Comparative table of blood sera

BLOOD FROM	PHYTOTOXIC INDEX
1. Normal individual	70–75
2. Menstruating individual	51–53
3. Pemphigus	50–59
4. Erythema multiforme	69–70
5. Toxico-dermatoses (including E. mult. bull.)	61–62
6. Dermatitis herpetiformis	69–70
7. Senear-Usher syndrome	67
8. Leprosy	47–50
9. Pernicious anemia	44–55
10. Trachoma	47–48
11. Syphilis (late)	81
12. Tuberculosis	80
13. Virus diseases	80–85

one hand, and by exposure of the same sera to 90 to 100r. units of X-rays as described above. This test, in contradistinction to the Macht-Pels test may be given the name of Macht-Ostro Test (tables 2 and 3).

By combining the two tests on a given sample of suspected pemphigus blood serum it is possible to establish a diagnosis of pemphigus in 24 hours when suitable plant test objects are available. Ordinarily it has been the custom in this laboratory to perform the Macht-Pels test on two different days with two different crops of Lupinus seedlings. An average of the two readings is taken as the phytotoxic index. At the present time the Macht-Ostro test is performed on the same stock of seedlings as the Macht-Pels test. If the irradiation of the specimen detoxifies it while the untreated specimen gives a toxic reaction it is the authors' opinion that the diagnosis of pemphigus is firmly established.

The above interesting findings with radiological experiments on pemphigus

blood suggested an inquiry as to whether the detoxification of pemphigus blood may follow, not only *in vitro* but also on administering deep X-ray treatment

TABLE 2

Control sera

PATIENT NO.	DIAGNOSIS	PHYTOTOXIC INDEX MACHT-PELS TEST	PHYTOTOXIC INDEX MACTT-OSTRO TEST	DOSAGE (IN AIR)
I	cat serum	82%	64%	92r.
II	cat serum	75%	70%	92r.
III	cat serum	76%	73%	92r.
IV	rabbit's serum	82%	80%	92r.
V	rabbit's serum	78%	76%	92r.
VI	normal human serum	79%	47%	108r.
VII	normal human serum	72%	56%	108r.
VIII	normal human serum	73%	64%	92r.
IX	normal human serum	75%	69%	92r.
X	normal human serum	79%	66%	92r.
XI	normal human serum	73%	64%	108r.
XII	normal human serum	80%	75%	92r.
XIII	normal human serum	75%	70%	92r.
XIV	normal human serum	79%	60%	92r.
XV	normal human serum	78%	78%	92r.
XVI	normal human serum	75%	73%	108r.
XVII	normal human serum	72%	61%	108r.
XVIII	carcinoma (man)	73%	54%	92r.
XIX	syphilis	80%	77%	92r.
XX	syphilis	80%	75%	92r.
XXI	syphilis	80%	74%	92r.
XXII	psoriasis	80%	81%	92r.
XXIII	psoriasis	78%	75%	108r.
XXIV	doubtful psoriasis	67%	60%	92r.
XXV	psoriasis	72%	66%	108r.
XXVI	psoriasis	70%	53%	92r.
XXVII	psoriasis	80%	80%	92r.
XXVIII	psoriasis	78%	75%	92r.
XXIX	psoriasis	74%	77%	92r.
XXX	purpura	68%	54%	92r.
XXXI	"Pseudo Pemphigus" (doubtful pemphigus)	68%	68%	92r.
XXXII	doubtful pemphigus	52%	56%	92r.
XXXIII	doubtful pemphigus	70%	71%	92r.
XXXIV	doubtful pemphigus	72%	73%	92r.
XXXV	doubtful pemphigus	71%	74%	92r.
XXXVI	myelogenous leukemia	76%	78%	108r.

to patients suffering from this disease. The present writers have already found this to be the case in three patients suffering from advanced pemphigus. These therapeutic considerations, however, do not fall within the scope of the present paper. A preliminary announcement concerning them has already

been published (20) and further experiences will be described after accumulation of a larger number of cases.*

TABLE 3

Pemphigus sera

PATIENT NO.	PHYTOTOXIC INDEX MACHT-PELS TEST	PHYTOTOXIC INDEX MACHT-OSRO TEST	DOSAGE (IN AIR)
I	40%	69%	92r.
II	50%	71%	92r.
III	47%	78%	92r.
IV	60%	86%	92r.
V	50%	83%	92r.
VI	64%	88%	92r.
VII	47%	76%	92r.
VIII	58%	73%	92r.
IX	55%	65%	92r.
X	57%	72%	92r.
XI	56%	68%	92r.
XII	64%	94%	92r.
XIII	55%	77%	108r.
XIV	52%	80%	108r.
XV	50%	83%	108r.
XVI	64%	88%	108r.
XVII	46%	66%	92r.
XVIII	41%	61%	108r.
XIX	41%	55%	108r.
XX	53%	70%	92r.
XXI	48%	64%	92r.
XXII	49%	73%	92r.
XXIII	59%	78%	108r.
XXIV	54%	70%	108r.
XXV	55%	77%	108r.
XXVI	52%	80%	108r.
XXVII	38%	60%	92r.
XXVIII	62%	81%	92r.
XXIX	40%	70%	108r.
XXX	59%	78%	92r.
XXXI	54%	70%	92r.
XXXII	53%	77%	92r.
XXXIII	50%	61%	92r.
XXXIV	44%	74%	108r.
XXXV	35%	69%	180r.

SUMMARY

Specimens of blood sera from pemphigus patients give a characteristic phytotoxic reaction to which the term Macht-Pels test has been applied. Recent

*Foot-note: On February 15, 1947, one hundred experiments altogether were performed with pemphigus blood, all of them confirming the validity of the tests here described. One specimen of serum from a case of *Mycosis fungoides* (from California), gave readings by both tests which were the same as for normal blood, and not like pemphigus thus differentiating the two diseases.

work on the effect of X-rays on various blood sera studied by phytopharmacological methods revealed that the sera of pemphigus are rapidly detoxified by exposure to short X-rays filtered through a composite filter. This so-called Macht-Ostro test is very characteristic since blood sera from other dermatological conditions as well as normal blood sera are not detoxified by exposure to X-rays. A simultaneous phytopharmacological examination of suspected pemphigus blood both by the Macht-Pels and Macht-Ostro test helps to establish the diagnosis of pemphigus in a shorter time.

REFERENCES

1. MACHT, D. I. AND LIVINGSTON, M.: Effect of Cocaine on the Growth of Lupinus Albus. A Constribution to the Comparative Pharmacology of Animal and Plant Protoplasm. J. Gen. Physiol. **4**: 573, 1922.
2. MACHT, D. I.: Applications of Plant Physiology to Medical Problems. Science, **71**: 302, 1930.
3. MACHT, D. I. AND LUBIN, D.: A Phytopharmacological Study of Menstrual Toxin. J. Pharmacol. & Exper. Therap. **22**: 413, 1924.
4. MACHT, D. I.: Study of Pernicious Anemia. J. Pharmacol. & Exper. Therap. **29**: 461, 1926.
5. MACHT, D. I.: Pernicious Anemia, An Experimental Contribution to the Etiology, Diagnosis and Treatment. J. A. M. A., **89**: 753, 1927.
6. MACHT, D. I. AND ANDERSON, WILLIAM T.: Clinical and Experimental Studies on Phototherapy of Pernicious Anemia. J. Pharmacol. & Exper. Therap., **34**: 365, 1928.
7. MACHT, D. I.: Concerning the Nature and Distribution of Pernicious Anemia Toxin. Festschrift für Professor Emil Burgi, 1932, p. 228.
8. MACHT, D. I.: Phytopharmacological and Photopharmacological Studies on Leprosy Serum. J. of the Philippine Islands M. A., **8**: 523, 1928.
9. MACHT, D. I.: Pharmacological Studies on the Blood of Trachoma. Proc. Soc. Exper. Biol. & Med., **27**: 150, 1929.
10. MACHT, D. I.: Phytopharmacological Studies on the Sera of Pemphigus, Syphilis and Leprosy. Acta Dermatologica (Japonia) **18**: 126, 1932.
11. MACHT, D. I. AND MACHT, M. B.: Phytotoxic Reactions of Some Blood Sera. J. Lab. & Clin. Med., **26**: 597, 1941.
12. MACHT, D. I. AND PELS, I. R.: Demonstration of Pemphigus Toxin. Proc. Soc. Exper. Biol. & Med., **25**: 237, 1927.
13. PELS, I. R. AND MACHT, D. I.: Phytopharmacological Examination of the Blood in Pemphigus and in Some Other Diseases of the Skin. Arch. Dermat. & Syph., **19**: 640, 1929.
14. PELS, I. R. AND MACHT, D. I.: Phytopharmacology of Pemphigus and Other Dermatoses. Additional Studies. Arch. Dermat. & Syph., **23**: 601, 1931.
15. PELS, I. R. AND MACHT, D. I.: Phytopharmacology of Pemphigus and Other Dermatoses. Additional Studies. Arch. Dermat. & Syph., **29**: 206, 1934.
16. MACHT, D. I.: Demonstration of Pemphigus Toxin in Fresh and Dry Blood. Arch. Dermat. & Syph., **36**: 1022, 1937.
17. MACHT, D. I. AND GRUMBEIN, M. L.: Phytotoxic Reactions of Fresh, Frozen and Dried Blood Specimens. Arch. Internat. de Pharmacodyn. et Thérap., **60**: 95, 1938.
18. MACHT, D. I. AND PELS, I. R.: Detoxification Experiments on Pemphigus Blood. Am. J. Physiol. (Proc.) **109**: July 1934.
19. MACHT, D. I. AND HILL, E. C.: The Effect of Ultra Violet X-rays and Radium Radiations on Normal Blood. J. Gen. Physiol., **6**: 671, 1924.
20. MACHT, D. I. AND OSTRO, M.: A Contribution to the Diagnosis and Treatment of Pemphigus. Urol. & Cutan. Rev., May 1946, p. 271.